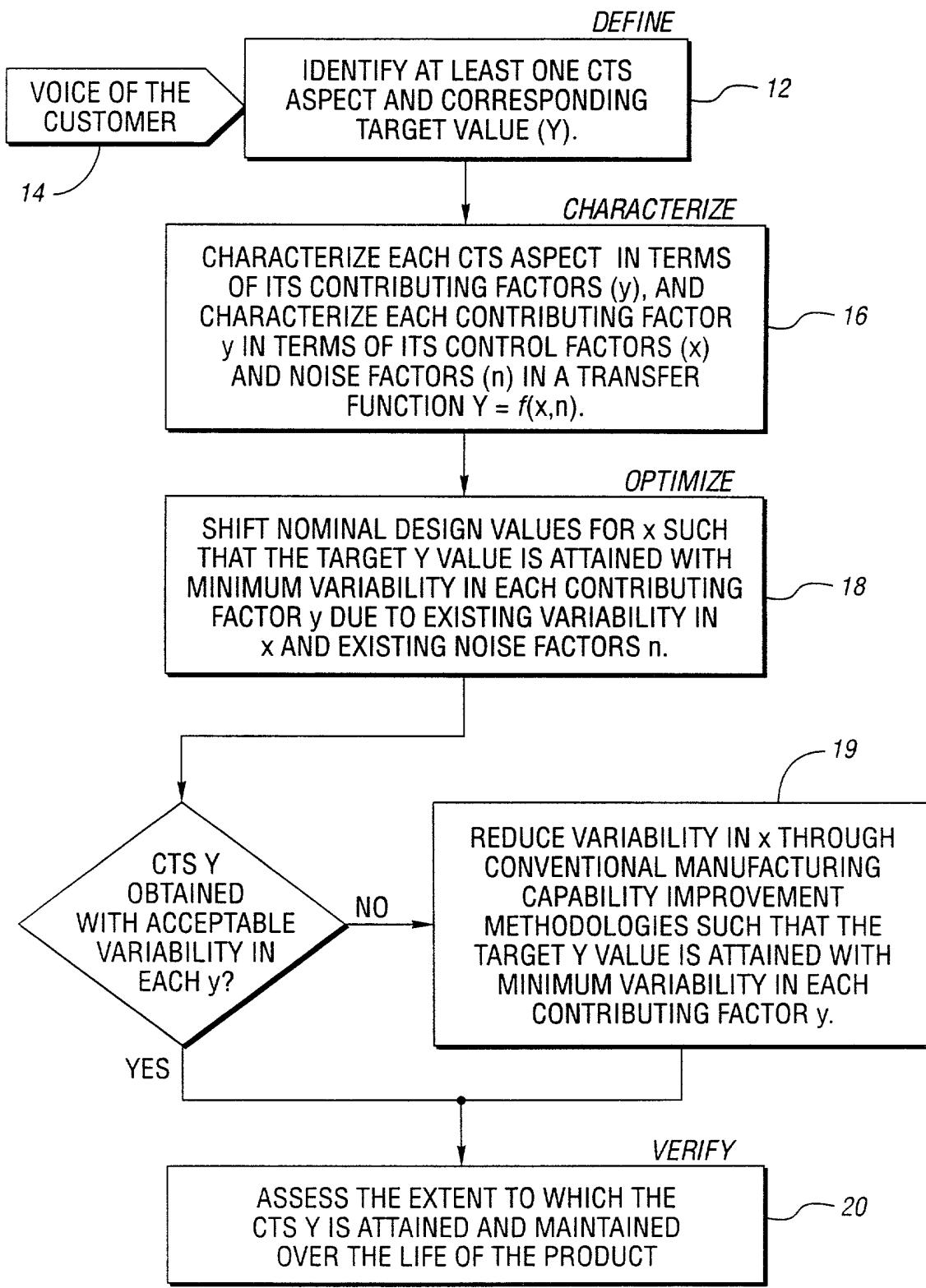
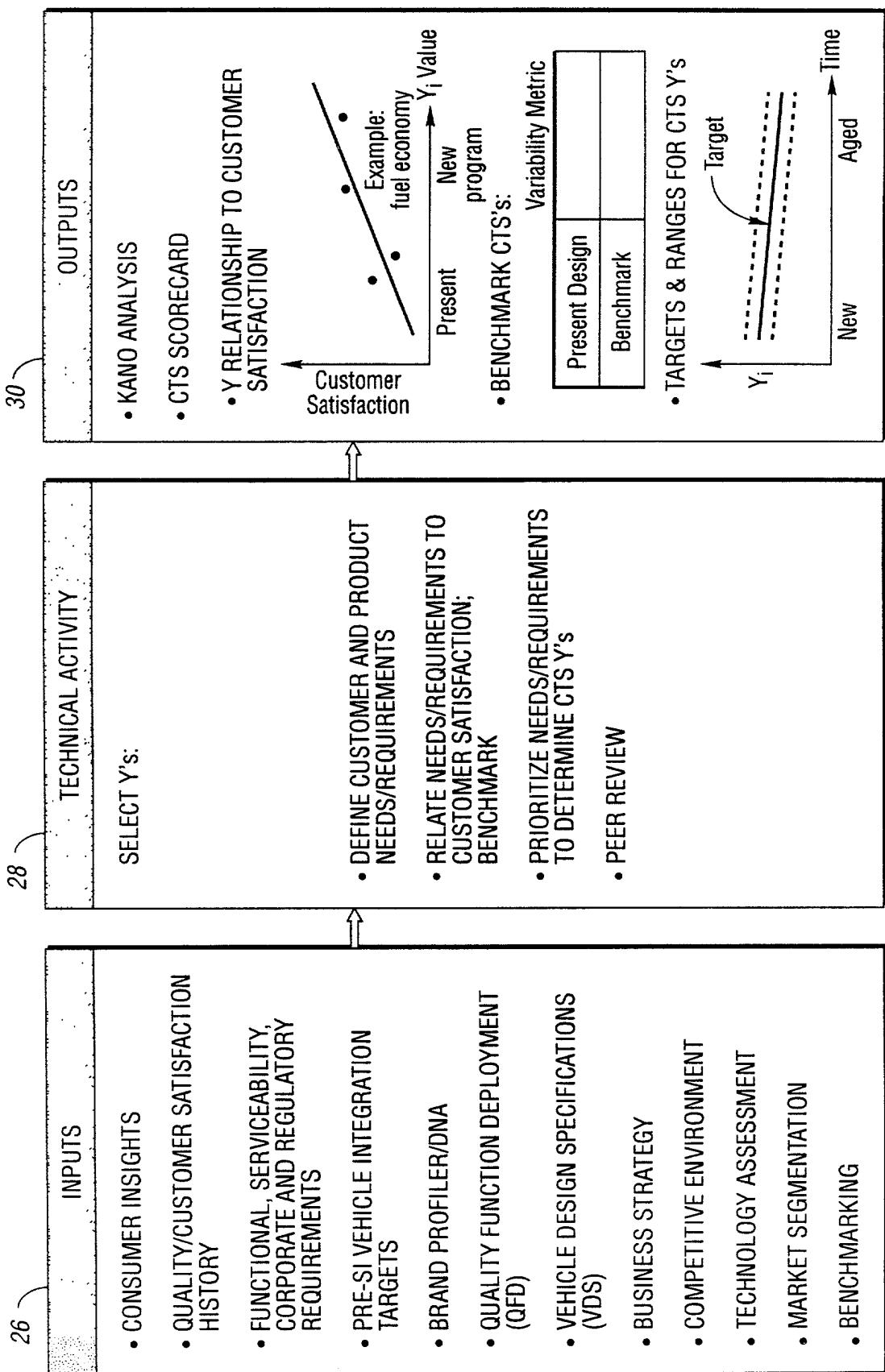


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*Fig. 1*

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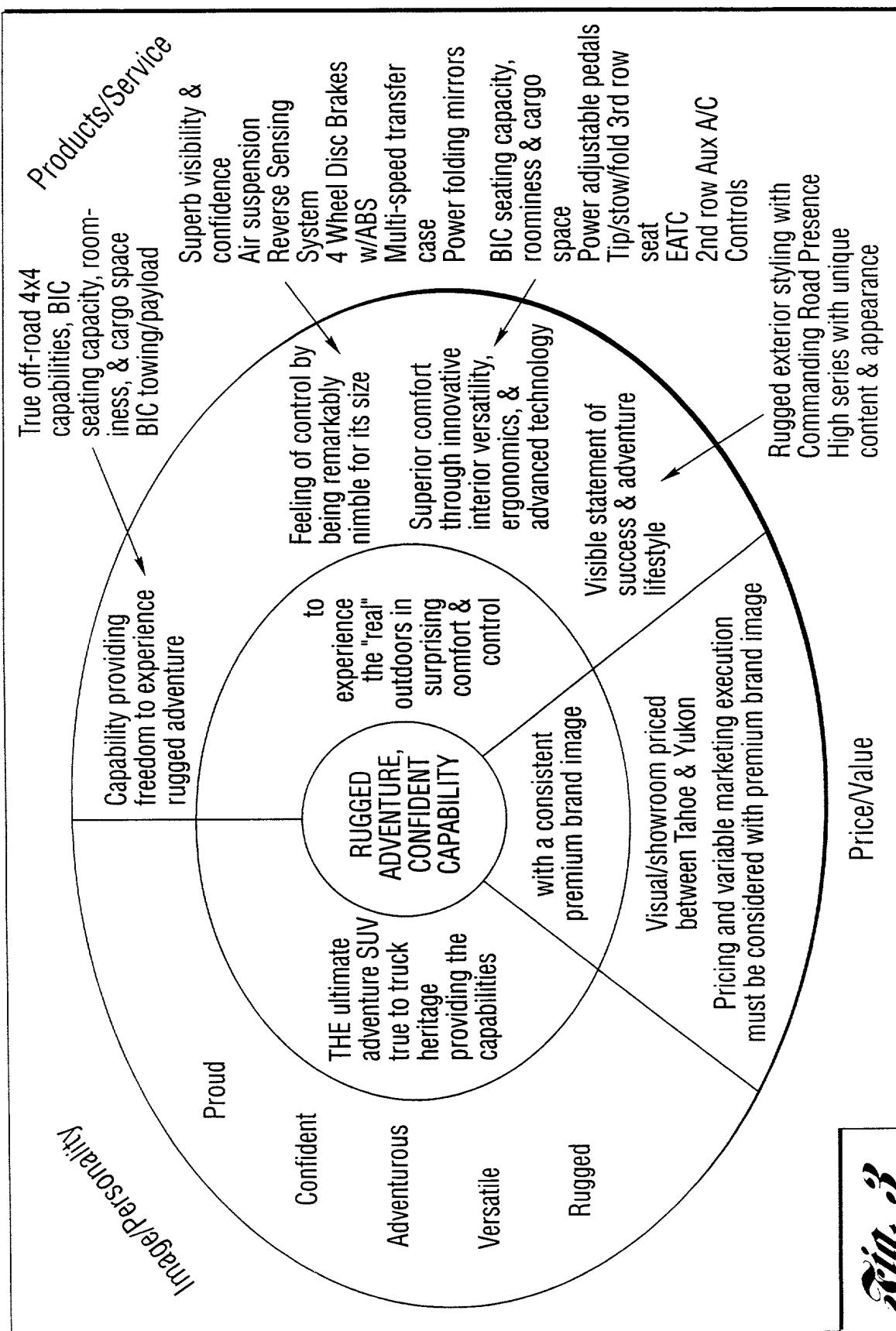


Title: **METHOD AND SYSTEM FOR PRODUCT OPTIMIZATION**

First Named Inventor: **CAROLYN ZELEK ET AL**

Application Serial No.: **10/043,696** / Atty. Docket No.: **FMC 1361 PUSP / 201-0240**

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BRAND PROFILER
PRODUCT ATTRIBUTE
LEADERSHIP STRATEGY

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ATTRIBUTE	ATTRIBUTE CLASS	PRIORITY (RANK)	PRIMARY BRAND POSITIONING	NAMEPLATE BRAND POSITIONING	PROGRAM SPECIFICS		PRESENT NAMEPLATE ENTRY
					TARGET OBJECTIVES	STATUS	
USAGE EXPERIENCE							
INTERIOR ROOMINESS	D	1	L A C M	L A C M	L A C M	L A C M	L A C U
ERGONOMICS/FLEXIBILITY/ COMFORT	D	2	L A C M	L A C M	L A C M	L A C M	L A C U
LUGGAGE/CARGO SPACE	D	3	L A C M	L A C M	L A C M	L A C M	L A C U
DURABILITY/CRAFTSMANSHIP	D	6	L A C M	L A C M	L A C M	L A C M	L A C U
QUIETNESS	I	8	L A C M	L A C M	L A C M	L A C M	L A C U
EASE OF ENTRY/EXIT	I	11	L A C M	L A C M	L A C M	L A C M	L A C U
RANGE/FUEL ECONOMY	G	15	L A C M	L A C M	L A C M	L A C M	L A C U
CLIMATE CONTROL	G	17	L A C M	L A C M	L A C M	L A C M	L A C U
EXTERIOR VISIBILITY	G	20	L A C M	L A C M	L A C M	L A C M	L A C U
COST OF OWNERSHIP	G	25	L A C M	L A C M	L A C M	L A C M	L A C U
DRIVING EXPERIENCE							
PERFORMANCE/TOWING	D	4	L A C M	L A C M	L A C M	L A C M	L A C U
RIDE	I	9	L A C M	L A C M	L A C M	L A C M	L A C U

Sig. A

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% SATISFACTION vs. RELATIVE LEVERAGE

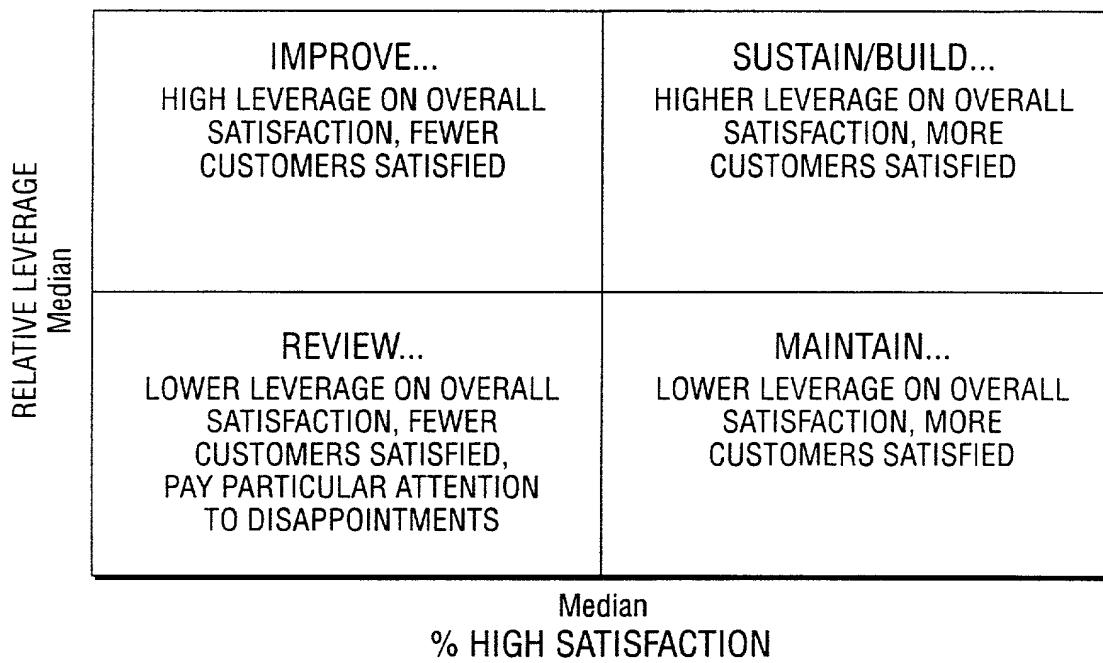


Fig. 5

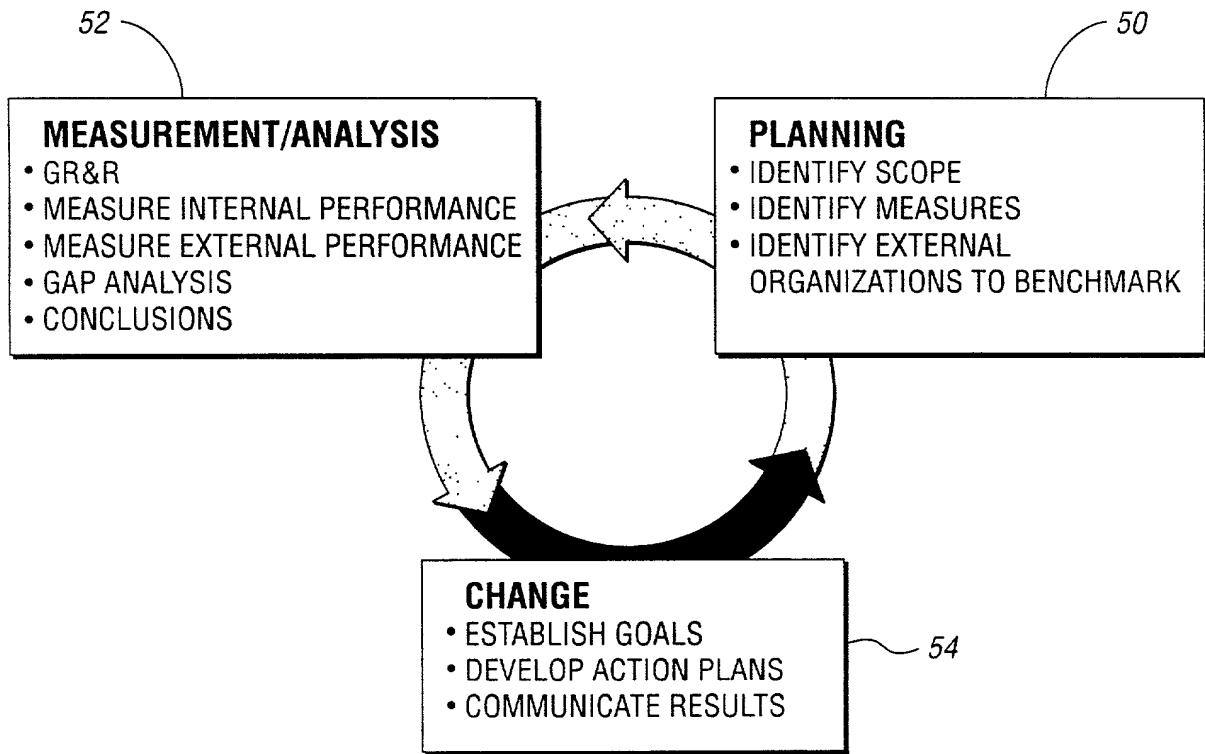


Fig. 6

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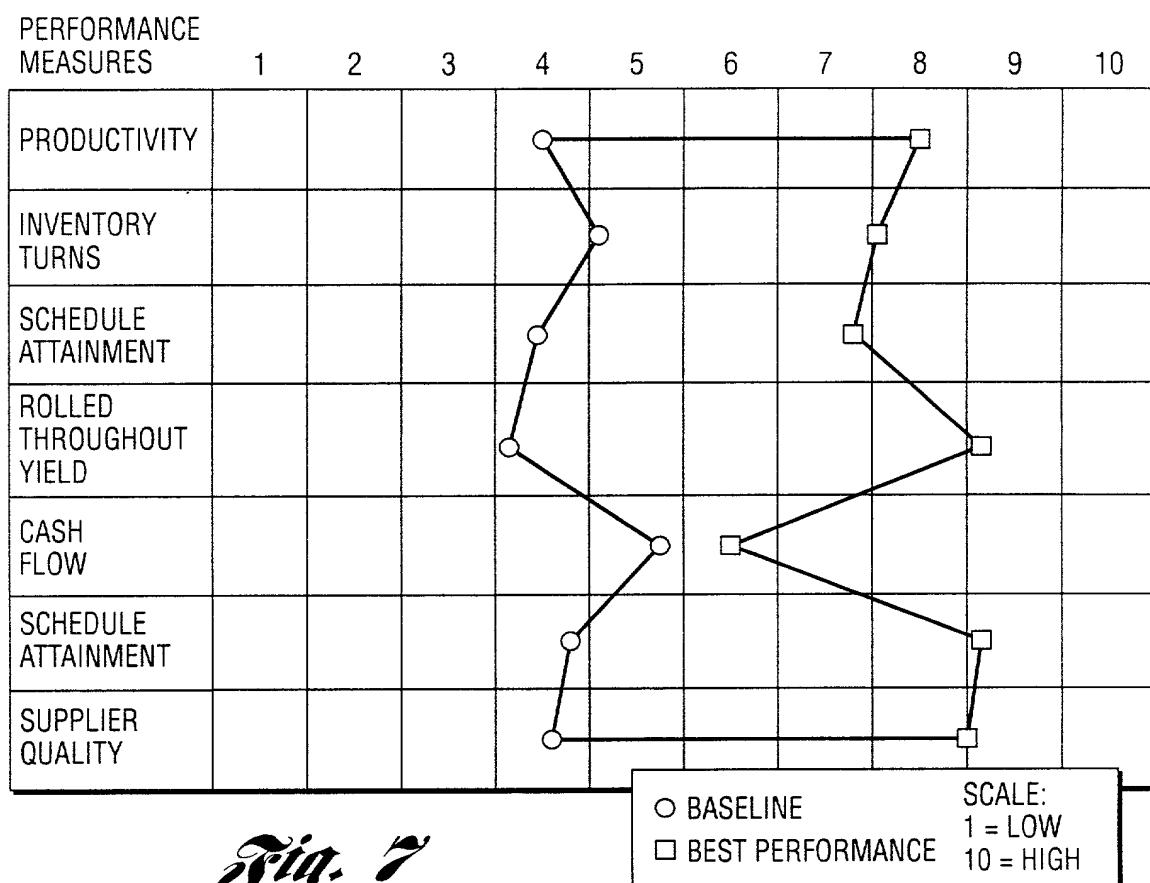


Fig. 7

KANO ANALYSIS

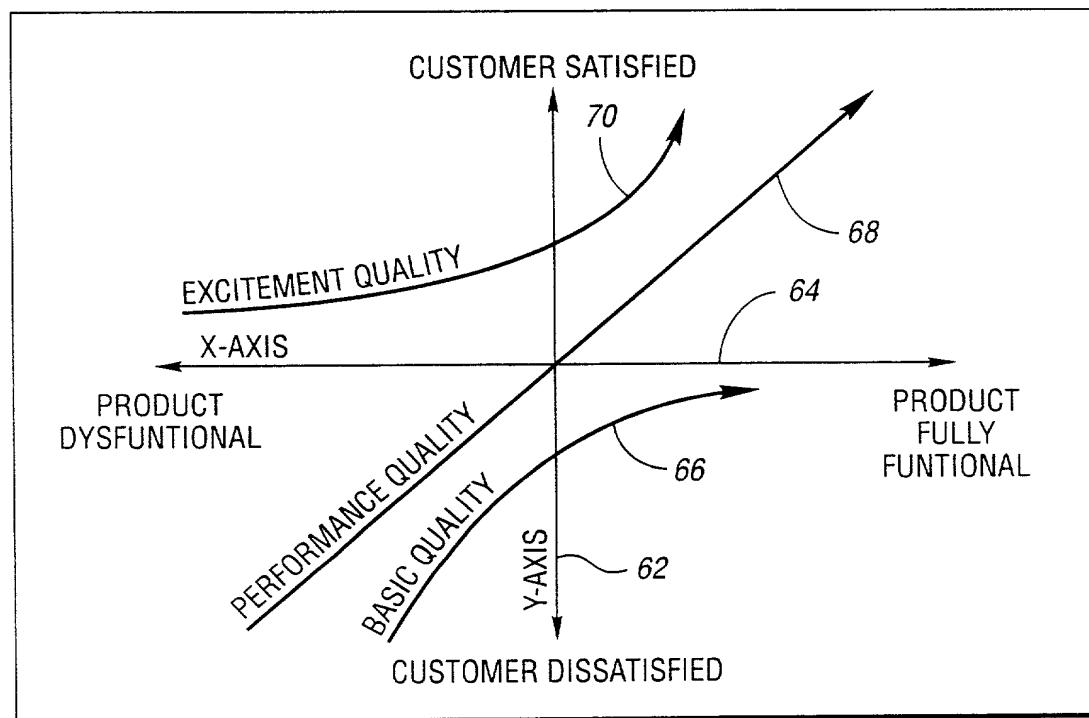
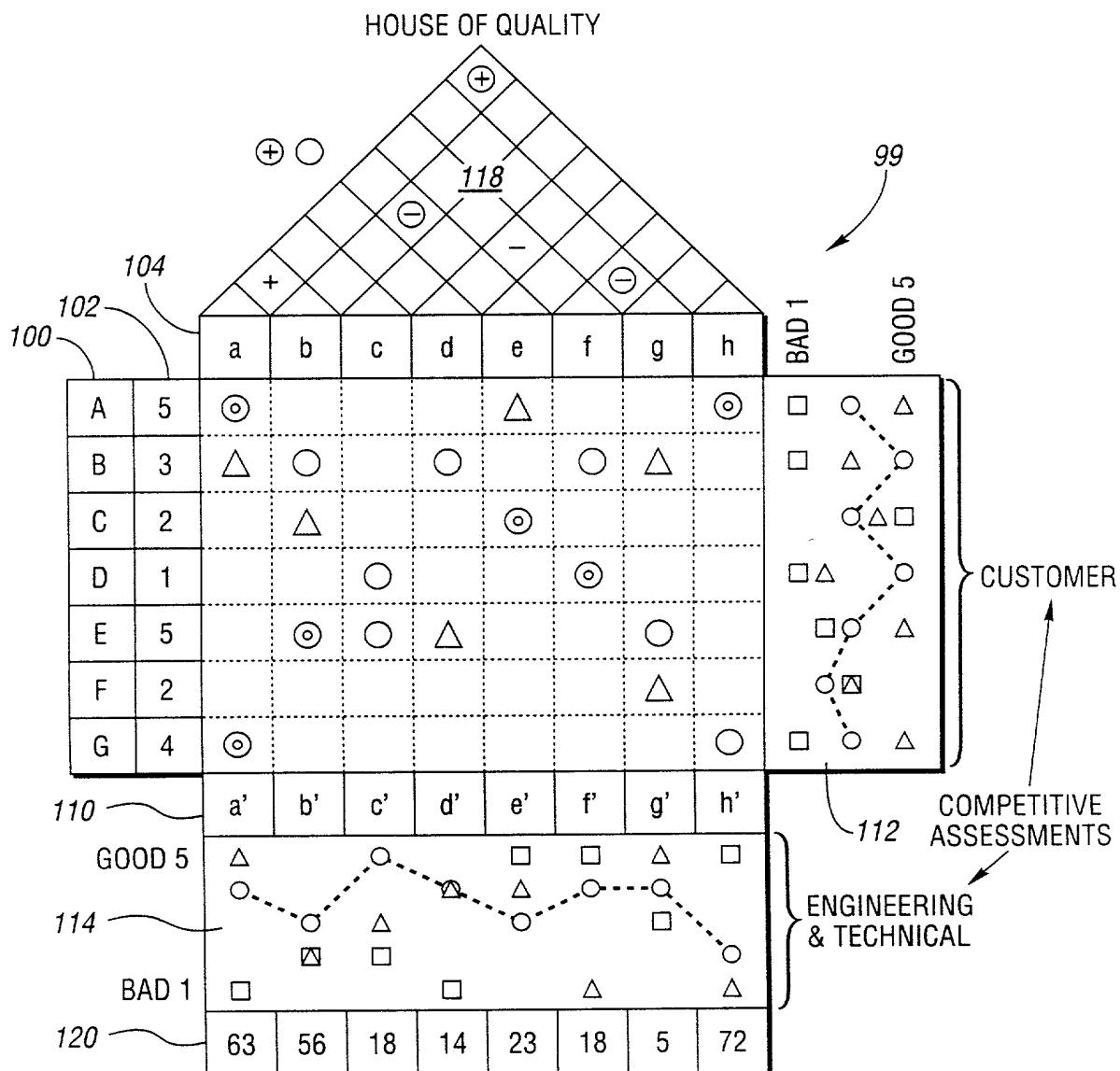


Fig. 8

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RELATIONSHIP MATRIX KEY

$\odot = 9$
 $\circ = 3$
 $\triangle = 1$

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CORRELATION MATRIX KEY

$\oplus = \text{STRONG POSITIVE}$
 $+$ = POSITIVE
 $-$ = NEGATIVE
 $\ominus = \text{STRONG NEGATIVE}$

COMPETITIVE ASSESSMENT KEY

$\circ = \text{OUR PRODUCT}$
 $\square = \text{COMPETITOR 1}$
 $\triangle = \text{COMPETITOR 2}$

Fig. 9

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Critical to Satisfaction (CTS) Scorecard

Attribute:

Project Description:

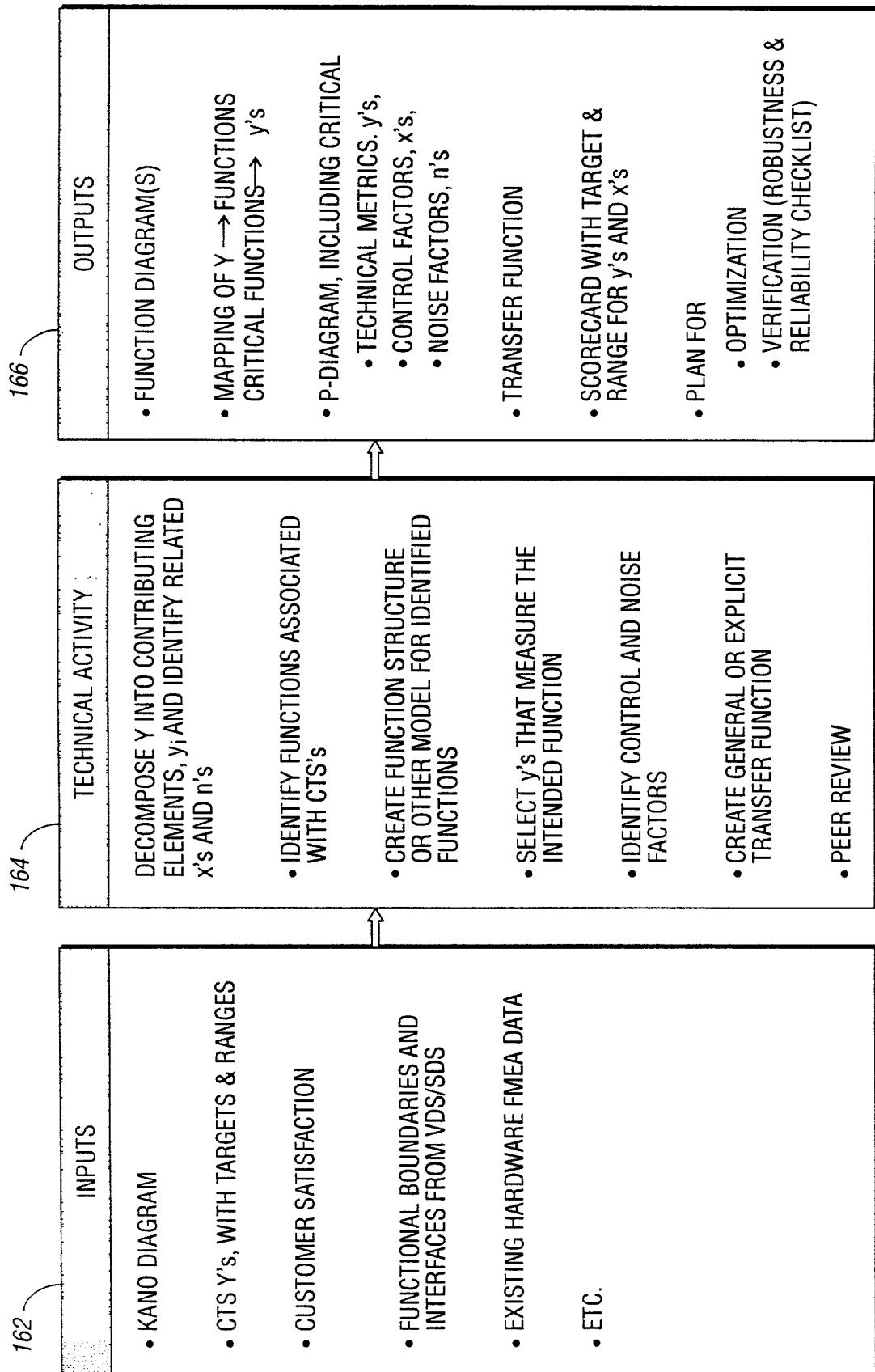
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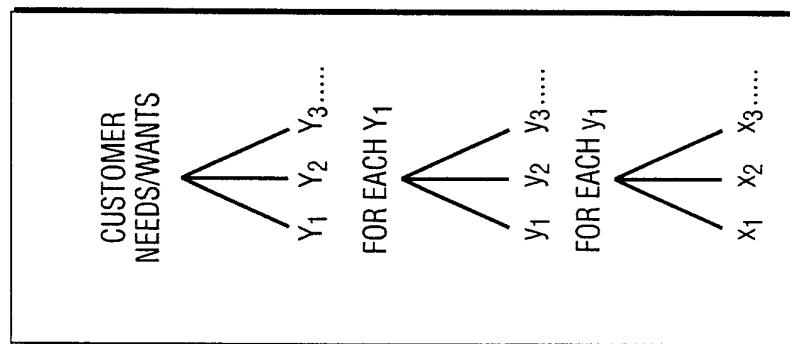
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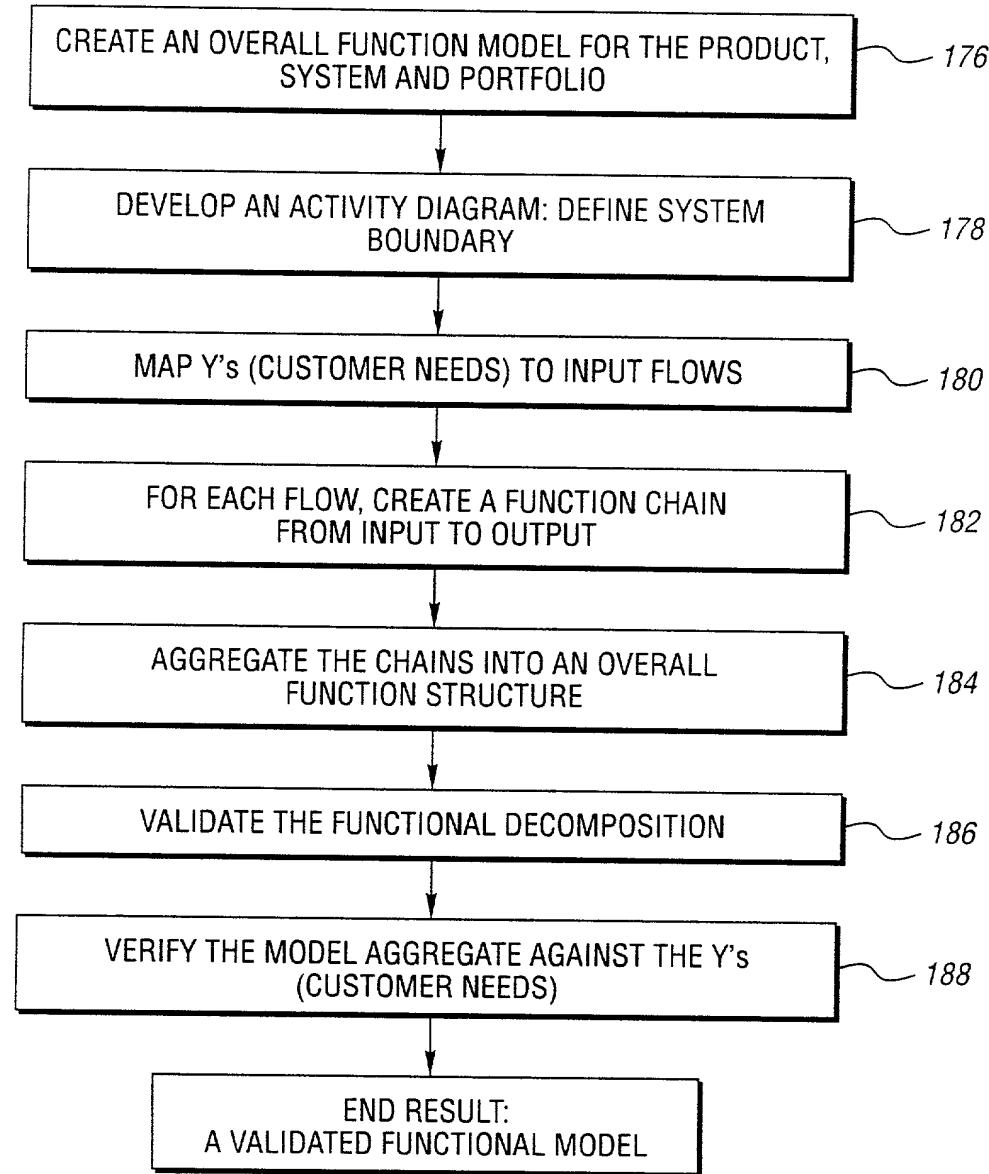
UNDERSTAND SYSTEM $Y \rightarrow \text{FUNCTIONS} \rightarrow y$	FUNCTION MAPPING $y \rightarrow f(x,n)$
<ul style="list-style-type: none"> • MODELING FUNCTION • FUNCTIONS VERSUS CONSTRAINTS • FUNCTION STRUCTURES • ACTIVITY DIAGRAMS • FLOW CHAINS • Y-FUNCTION MATRIX • FUNCTION-FUNCTION MATRIX • TECHNICAL MATRIX: y's • FUNCTIONAL MEASUREMENT • UPDATE Y-y MATRIX (QFD) 	<ul style="list-style-type: none"> • FACTORS: x's AND n's • AREA ANALYSIS • EXPLORATORY EXPERIMENTATION • CORRELATION • TRANSFER FUNCTIONS • AREA ANALYSIS • REGRESSION • FLOW ANALYSIS • CAE TOOLS • ESTABLISHING CRITICAL x's • P-DIAGRAMMING • CORRELATION • SENSITIVITY ANALYSIS



Drg. 12b

Drg. 12a

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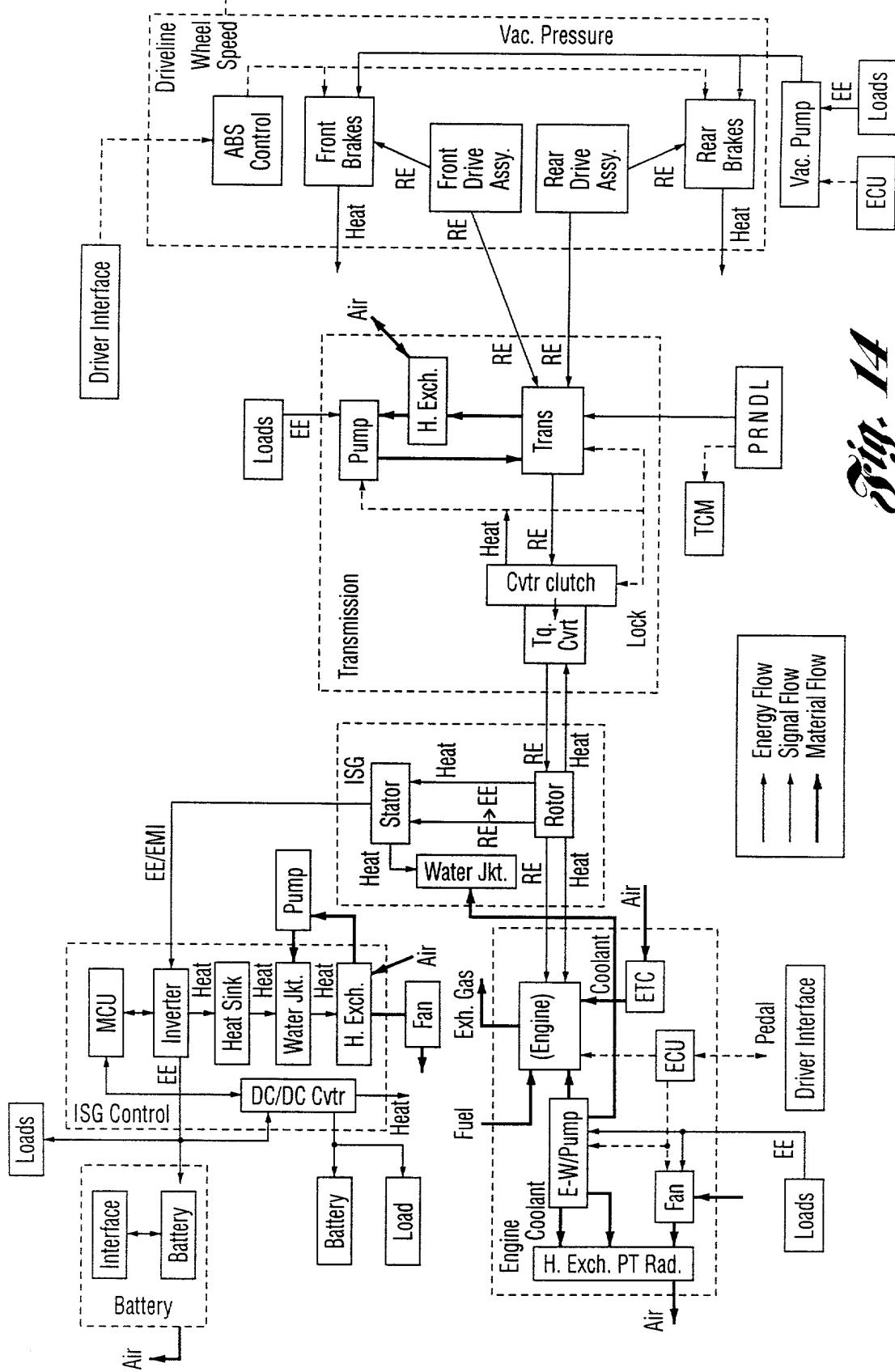
Fig. 13

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TRANSFER FUNCTIONS

- A QUANTITIVE RELATIONSHIP BETWEEN DEPENDENT AND INDEPENDENT VARIABLES THAT CAN BE EXPRESED AS AN EQUATION OF THE FORM

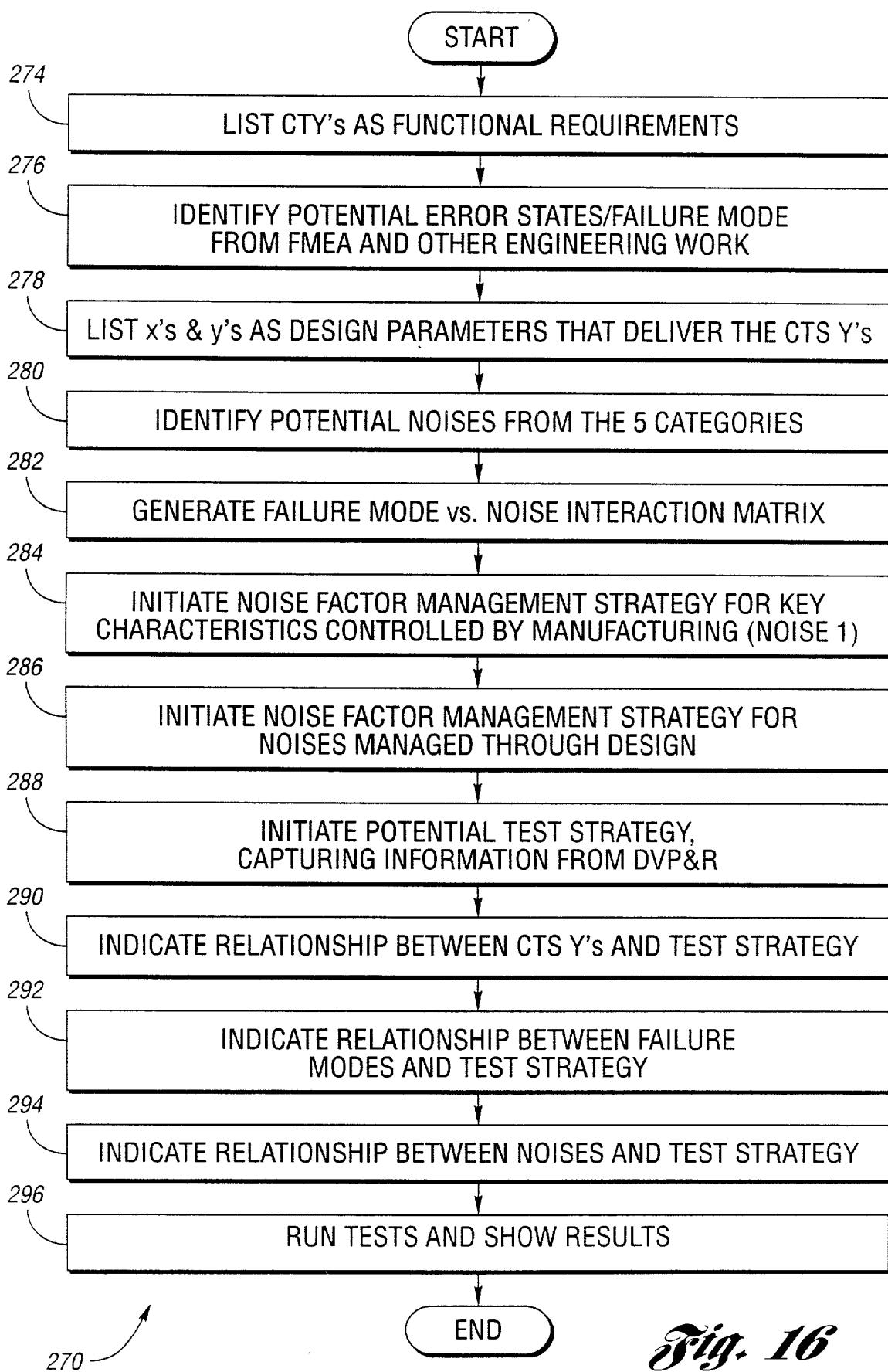
$$\begin{aligned} Y &= F(y_1, \dots, y_n) \\ \text{OR} \\ y &= f(x_1, \dots, x_n) \end{aligned} \quad \left. \right\}^{190}$$

- ACTUAL TRANSFER FUNCTION MAY LOOK SOMETHING LIKE THIS

$$\begin{aligned} Y &= \alpha \sin y_1 + \beta \cos y_2 + \gamma y_3, \\ y &= \beta_0 + \beta_1 x_1^{\alpha_1} + \beta_2 x_2^{\alpha_2} + \beta_3 x_3^{\alpha_3} + \lambda_1 n_1, \\ &\text{etc.} \end{aligned} \quad \left. \right\}^{192}$$

Fig. 15

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*Fig. 16*

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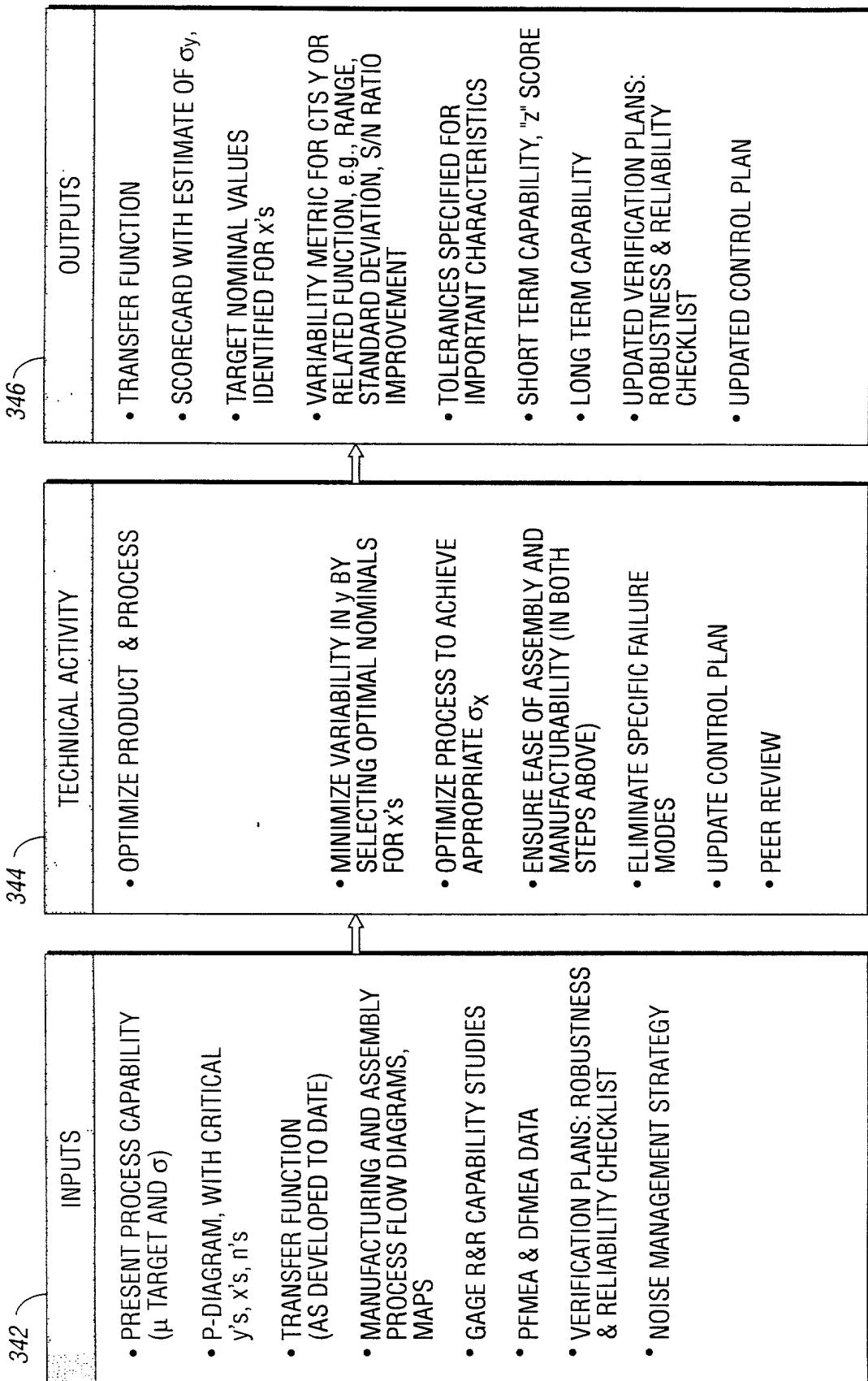
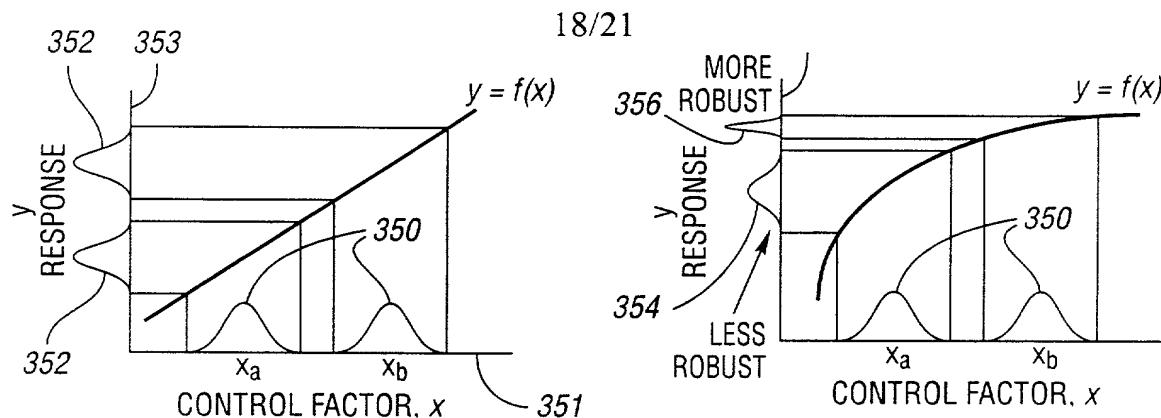


Fig. 18



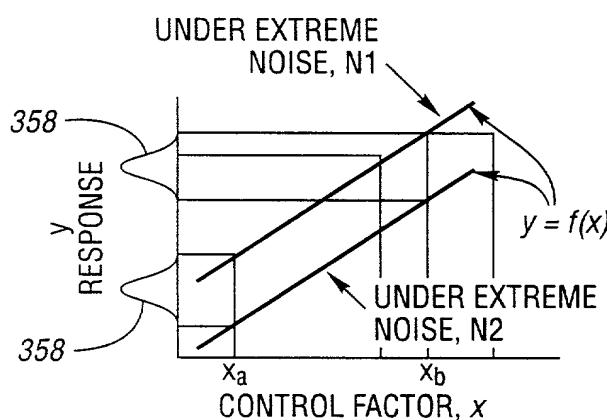
"SHIFT"

- WHEN $f(x)$ IS LINEAR, THE NOMINAL VALUE OF THE CONTROL FACTOR x HAS NO EFFECT ON THE VARIABILITY OF THE RESPONSE, $f(x)$.
- CHANGE THE LEVEL OF THIS CONTROL FACTOR TO SHIFT THE RESPONSE WITHOUT AFFECTING VARIABILITY.

"SHRINK"

- WHEN $f(x)$ IS NON-LINEAR, THE NOMINAL VALUE OF THE CONTROL FACTOR x CAN HAVE A MAJOR EFFECT ON THE VARIABILITY OF THE RESPONSE, $f(x)$.
- CHANGE THE LEVEL OF THIS CONTROL FACTOR TO DESENSITIZE THE RESPONSE TO THE CONTROL FACTOR VARIABILITY.

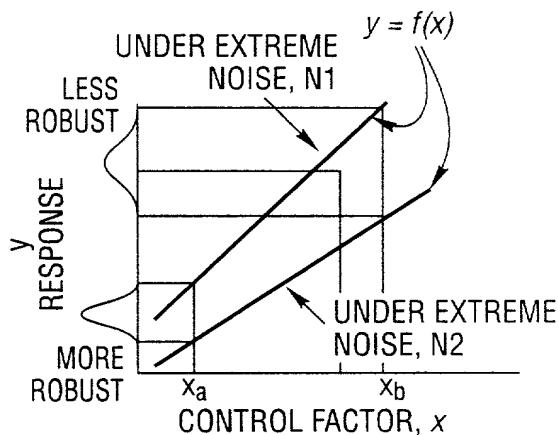
Fig. 19a



"SHIFT"

- WHEN THE CONTROL FACTOR x DOES NOT INTERACT WITH THE NOISE, THE NOMINAL VALUE OF x HAS NO EFFECT ON THE RESPONSE VARIABILITY.
- CHANGE THE LEVEL OF THIS CONTROL FACTOR TO SHIFT THE RESPONSE WITHOUT AFFECTING VARIABILITY.

Fig. 19b



"SHRINK"

- WHEN THE CONTROL FACTOR x INTERACTS WITH THE NOISE, THE NOMINAL VALUE OF x CAN HAVE A MAJOR EFFECT ON RESPONSE VARIABILITY.
- CHANGE THE LEVEL OF THIS CONTROL FACTOR TO DESENSITIZE PERFORMANCE TO THE NOISE AND SHRINK THE RESPONSE VARIABILITY.

Fig. 20a

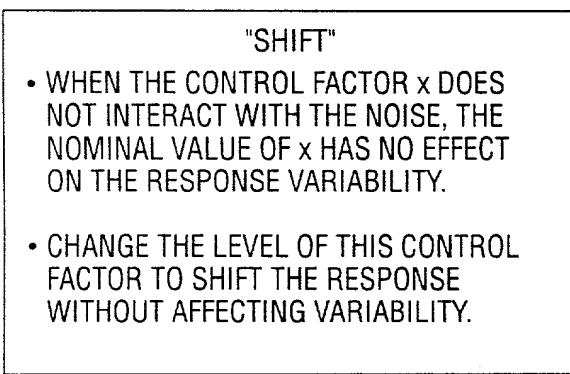
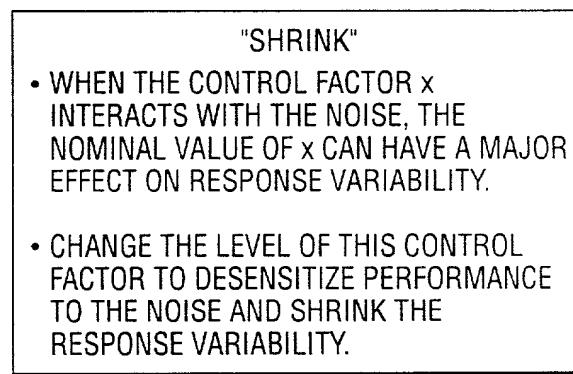


Fig. 20b



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Vehicle/Part Name:		<u>5.4L Engine Compression Ration</u>			
Description:		<u>Compression Ration Contribution</u> <u>to Engine Quietness</u>			
Performance		Transfer Function			
Characteristic	Units	Y/N	Formula (enter here)		
CR	Ratio	Y	y = f(x, n)		
		372	380	374	
		382	376		
Variables		Range		Contribution	
No.	Characteristic	Units	Min	Max	Sensitivity
1	Cyl Hd Cmbr Vol	cc			-0.27
2	Blk Dk Crk/Deck Cl	mm	255.91	256.04	-0.12
3	Head Gasket Thk	mm	0.97	1.06	-0.055
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
Cell Shading Key					
<input type="button" value="Enter Data"/>		Enter Data			
<input type="button" value="Do not enter data (Calculation)"/>		Do not enter data (Calculation)			
Confidence Ratings					
High (H)	Estimate based on customer-correlated model of same parts				
Med (M)	Estimate based on partial customer correlation or surrogate parts				
Low (L)	Estimate without customer correlation or no process data available				

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Fig. 21a

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Specification			Predicted Performance Capability			
Target	LSL	USL	mean: μ	s.d.: σ	Short/Long	Confidence
9	8.85	9.15	8.898125	0.094551	Short	High

x's, Input Control Factors

n's, Input Control Factors

ANSWER

Enter Formula (must refer to cells J13, J14, ... representing x_1, x_2, \dots)

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Do not enter data (Not applicable for Noise Factors)

Fig. 21b

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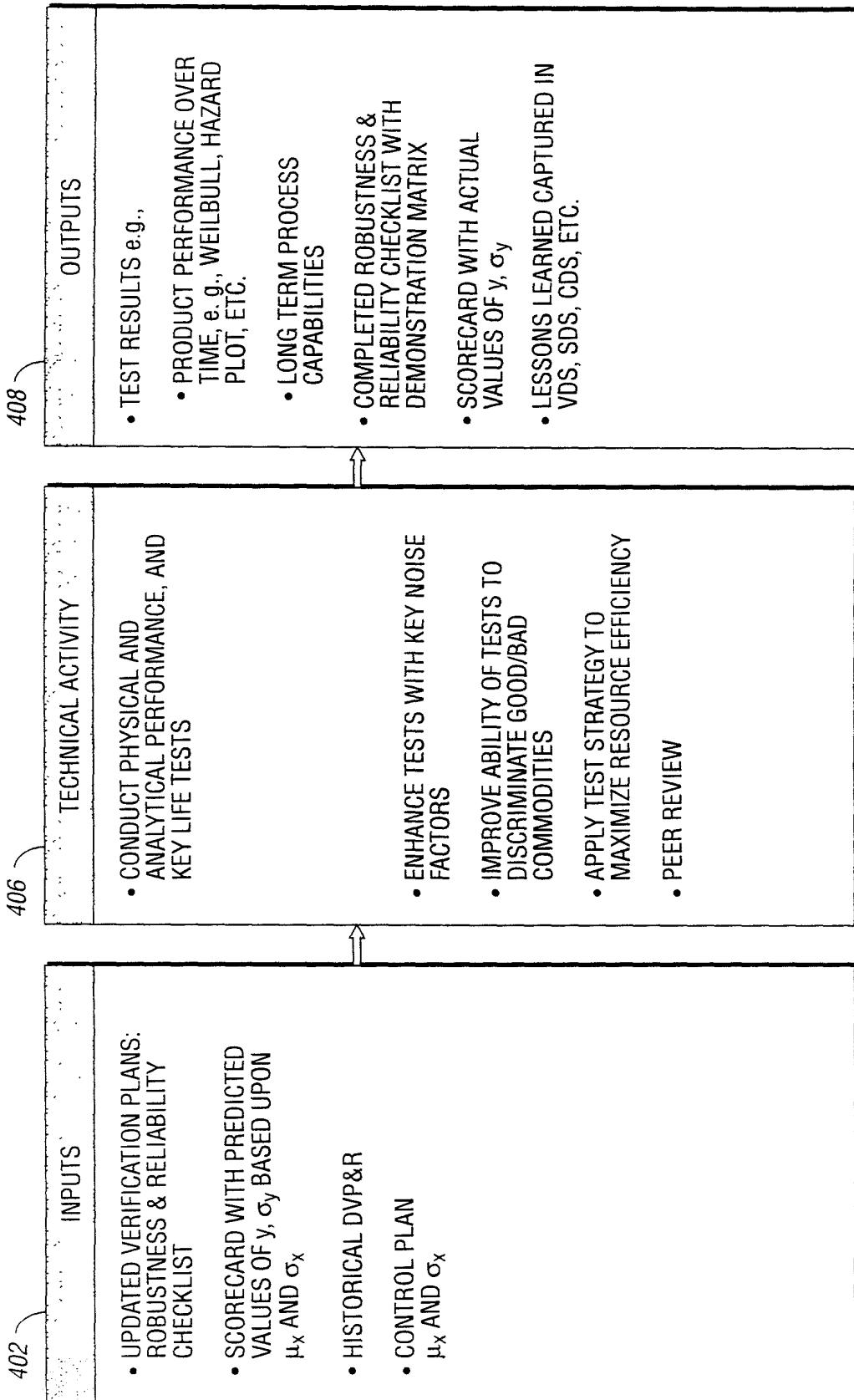


Fig. 22